

IPC-2578

Sectional Requirements for Supply Chain Communication of Bill of Material and Product Design Configuration Data - Product Data eXchange (PDX)



Endorsed by the National Electronics Manufacturing Initiative (NEMI)

IPC-2578

November 2001

A standard developed by IPC

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- Contain simple (simplified) language
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- Focus on end product performance
- Include a feedback system on use and problems for future improvement

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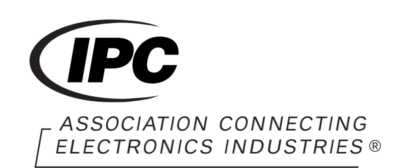
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IPC-2578

PDX
– Bill of Material

Sectional Requirements for Supply Chain Communication of Bill of Material and Product Design Configuration Data – Product Data eXchange (PDX)

A standard developed by the Bill of Material and Product Design Configuration Exchange Task Group (2-15e) of the Supply Chain Communication Subcommittee (2-15) of IPC.

The IPC-2578 standard describes the requirements for the exchange of Bills of Material (BOM), Approved Manufacturer Lists (AML), Approved Supplier Lists (ASL), as well as the description of the components involved on the Bill of Material.

This project was initiated by the NEMI Virtual Factory Information Interchange Project (VFIIP) which established proof of concept. After completion, the project leaders recommended standardization by IPC under the ANSI rules and procedures.



November 20, 2001

Users of this standard are encouraged to participate in the development of future revisions.

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Acknowledgment

Any Standard involving a complex technology draws material from a vast number of sources. While the principal members of the Bill of Material and Product Design Configuration Exchange Task Group (2-15e) of the Supply Chain Communication Subcommittee (2-15) are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

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NIST

Bill of Material and Product Design Configuration Exchange Task Group

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Carlos Fernandez, Compaq Computers
Xiang Fu, Agile Software
Martin Zimmerman, Nortel Networks

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Barbara Goldstein, NIST
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John Minchella, Celestica
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Mike Stankavich, Intel Corporation
Richard Kubin, Nortel Networks
Ben Poole, SCI Systems
E. Harry Parkinson, Parkinson Consulting
Bob Neal, Agilent Technologies

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Sectional Requirements for Supply Chain Communication of Bill of Material and Product Design Configuration Data – Product Data eXchange

Introduction

The IPC-2571 document provides introductory and explanatory information about this standard and includes other elements that are also required or used. The IPC-2571 dictates the required package structure and XML format for information exchange using any of the subsequent IPC-257x standards such as this one. In any such exchange, a Product Data eXchange package must be defined which contains at a minimum a single pdx.xml file. This file in turn is required to contain a single ProductDataeXchangePackage element, and may contain any number of other elements from this specification. The Product Data eXchange package may optionally contain or refer to related external files.

There are relationships to other standard initiatives. These include the following:

IPC 2510 – GenCAM

The GenCAM standard (IPC 2510) describes printed boards and printed board assemblies. GenCAM describes a printed board in enough detail to be able to manufacture and assemble a board. The Product Data eXchange standard, on the other hand, is intended for high-level supply chain communication of product definition data.

RosettaNet

RosettaNet is dedicated to the development and deployment of standard electronic business interfaces to align the processes between supply chain partners on a global basis.

Open Applications Group, Incorporated (OAGI)

The Open Applications Group, Incorporated has defined standard interfaces between enterprise software applications.

1 Scope

This standard (IPC 2578) covers the sectional requirements for the exchange of Bills of Material (BOM), Approved Manufacturer Lists (AML), Approved Supplier Lists (ASL), as well as the description of the components involved on the Bill of Material. Component data includes electrical, mechanical and package type. This standard also contains change history for Engineering Change Orders (ECO), and can capture Multiple Change Order (MCO) information.

2 Applicable Documents

The following documents contain provisions, which, through reference in this text, constitute provisions of this standard. All documents are subject to revision. Parties who make agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below.

IPC-T-50 Terms and Definitions for Interconnecting and Packaging Electronic Circuits.

IPC 2510 Generic Computer Aided Manufacturing Descriptions for Printed Boards and Printed Board Assembly.

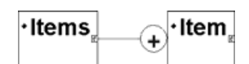
IPC-2571 Generic Requirements for Electronics Manufacturing Supply Chain Communication - Product Data eXchange (PDX)

3 Graphical Representation of Product Data eXchange

The IPC-2571 is a mandatory part of this standard. The graphical representation of the entire Product Data eXchange standard suite is detailed in the IPC-2571.

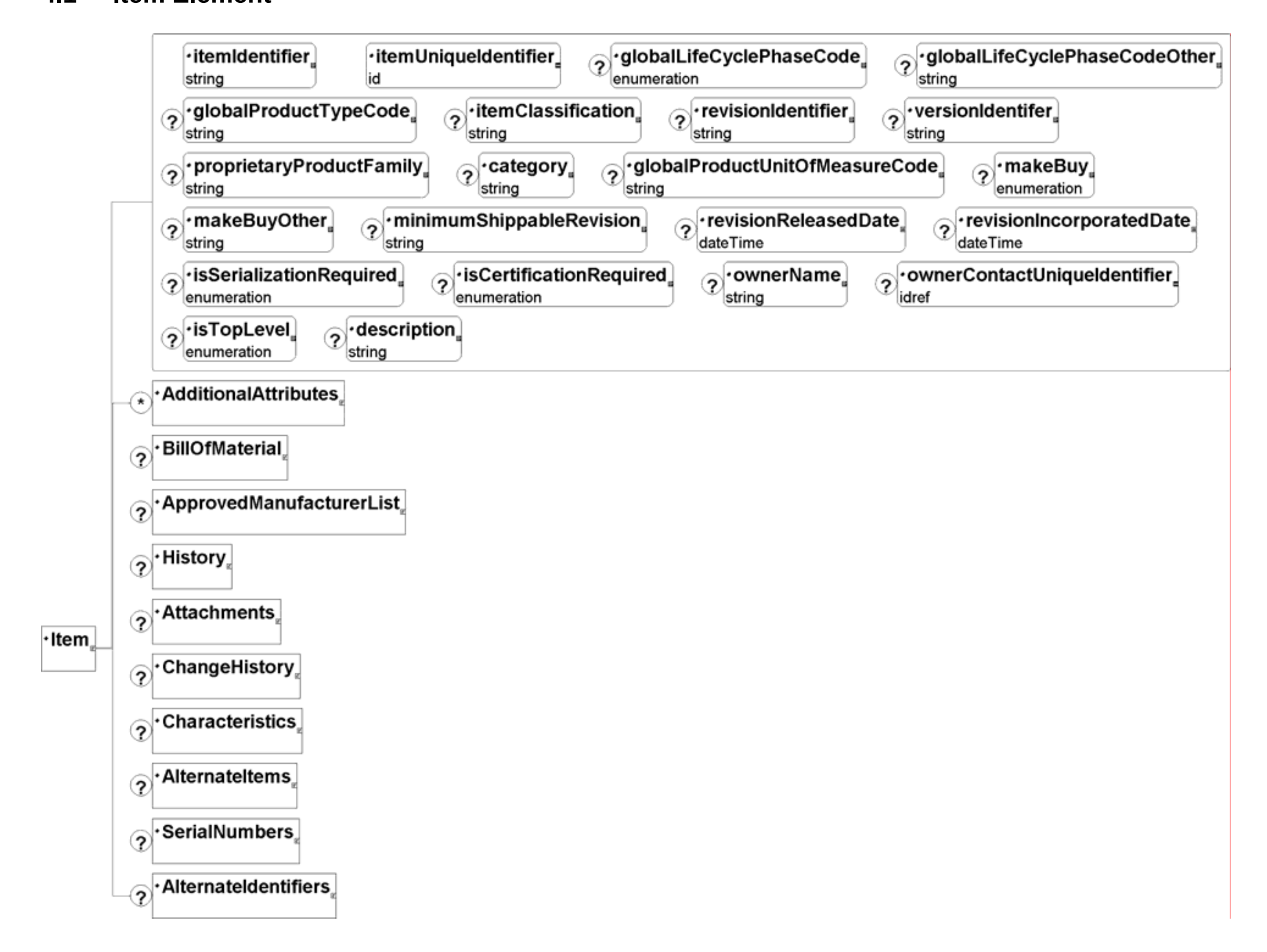
Note that graphics and a table of attribute descriptions are provided as an aid to understanding the elements in the PDX standard suite. In any instance where the XML DTD conflicts with an image or description, the DTD should be considered normative.

4 Items Element



The Items element is a collection of Item elements that define item master data for all items in the product configuration, including finished goods, parts, assemblies (including phantom assemblies), software, documentation, manuals, and drawings.

4.1 Item Element



The Item element contains item master data defined in the following table. As shown in the diagram, the Item element may be associated with a number of other elements. Note that Item may link to one or more AdditionalAttribute elements through an AdditionalAttributes element, but such usage would constitute a non-standard extension of PDX.

Attribute Name	Type	Required?	Description
itemIdentifier	CDATA	#REQUIRED	Item identifier
itemUniqueIdentifier	ID	#REQUIRED	Unique identifier for the item.
globalLlifeCyclePhaseCode	(Design | Preliminary | Prototype | Pilot | Conditional | Production | Pending | Inactive | Unqualified | Disqualified | Obsolete | Other)	#IMPLIED	Lifecycle phase of item.

Attribute Name	Type	Required?	Description
globalLlifeCyclePhaseCodeOther	CDATA	#IMPLIED	If the above globalLlifeCyclePhaseCode attribute is set to “Other”, use this attribute to provide a more descriptive value. If the above globalLlifeCyclePhaseCode is NOT set to “Other”, LEAVE THIS FIELD BLANK.
GlobalProductTypeCode	CDATA	#IMPLIED	Product type code
ItemClassification	CDATA	#IMPLIED	The classification of the item
revisionIdentifier	CDATA	#IMPLIED	Revision of item
versionIdentifier	CDATA	#IMPLIED	Version of Item. An item can have both a revision and a version
proprietaryProductFamily	CDATA	#IMPLIED	Product line(s) that the item belongs to
category	CDATA	#IMPLIED	Category of parts (electrical, mechanical, software, etc.)
globalProductUnitOfMeasureCode	CDATA	#IMPLIED	Unit of measure for item (gallons, inches, etc.)
makeBuy	(Make | Buy | Consigned | VendorManaged | Subcontracted | Unspecified | Other)	#IMPLIED	Make or Buy decision.
makeBuyOther	CDATE	#IMPLIED	If the above makeBuy attribute is set to “Other”, use this attribute to provide a more descriptive value. If the above makeBuy attribute is NOT set to “Other”, LEAVE THIS FIELD BLANK.
minimumShippableRevision	CDATA	#IMPLIED	Earliest revision that may be shipped at this time.
revisionReleasedDate	CDATA	#IMPLIED	Date the item was released
revisionIncorporatedDate	CDATA	#IMPLIED	Date the item was incorporated
isSerializationRequired	(Yes | No)	#IMPLIED	Serial number required for item (default is No)
isCertificationRequired	(Yes | No)	#IMPLIED	Certification Required (default is No)
ownerName	CDATA	#IMPLIED	Owner or responsible party for the item
ownerContactUniqueIdentifier	IDREF	#IMPLIED	Refers to contactUniqueIdentifier attribute of the Contact element for the owner or responsible party for the Item. See discussion of “Inclusion of Linked Objects” in IPC 2571.
IsTopLevel	(Yes | No)	#REQUIRED	See Introduction document “TopLevel attribute” (Default is No)
description	CDATA	#IMPLIED	Description of the item

5 SerialNumbers Element



The SerialNumbers collection contains serial number data to be assigned to the finished product. It contains one or more SerialNumberRange or SerialNumberIdentification elements. The SerialNumberRange element **shall** be used for sequential serial number blocks. The SerialNumberIdentification element **shall** be used for non-sequential serial numbers.

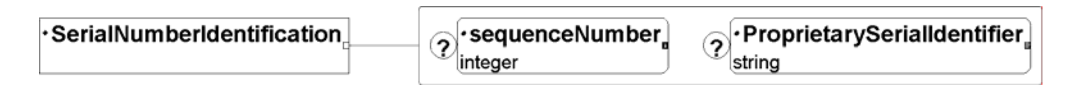
5.1 SerialNumberRange



The SerialNumberRange element **shall** be used for items that are assigned serial numbers from a sequential range.

Attribute Name	Type	Required?	Description
firstSerialNumber	CDATA	#REQUIRED	The first serial number in the range
lastSerialNumber	CDATA	#IMPLIED	The last serial number in the range
increment	CDATA	#IMPLIED	The increment by which to separate the serial numbers that are assigned. Assumed to be 1 if not specified
sequenceNumber	CDATA	#IMPLIED	Indicates the sequence in which this serial number range should be used

5.2 SerialNumberIdentification



The SerialNumber element **shall** be used for items that require a collection of non-sequential serial numbers.

Attribute Name	Type	Required?	Description
sequenceNumber	CDATA	#IMPLIED	Indicates the sequence in which this serial number should be used
proprietarySerialIdentifier	CDATA	#IMPLIED	A single Serial number to be assigned to an item

6 BillOfMaterial Element



The BillOfMaterial element is a collection of BillOfMaterialItem elements that describes an assembly, kit or a single item. The BillOfMaterial must be associated to an Item element. The BillOfMaterial element is used to hold a collection of BillOfMaterialItem elements, and has no attributes of its own.

The BOM may be encoded in either of two forms. One form collects all identical part numbers and indicates the quantity and reference disignator(s). The other form separately lists each reference designator and the associated part number. When the receiving system requires the data to be in one of these forms, the adapter may need to include the ability to convert the BOM form should the non-preferred form be received.

6.1 BillOfMaterialItem Element

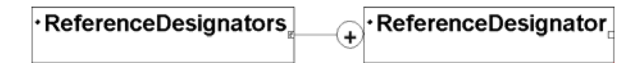


A BillOfMaterialItem describes the relationship between a parent (assembly) item and a child (component) item. A BillOfMaterialItem element may contain items with no corresponding Item element entry. The itemUniqueIdentifier attribute refers to an Item that may or may not be in the PDX file currently being transmitted. This might be useful in cases where previous item master data was exchanged.

It is recommended that phantom parts be entered into the Item elements like ordinary items. A phantom item is an intermediate assembly used to facilitate the manufacturing or costing process. A phantom bill of material is a bill of material coding and structuring technique used primarily for transient (non-stocked) subassemblies. When a phantom item appears in a BillOfMaterialItem, the Item.itemType attribute **shall** be “phantom”.

Attribute Name	Type	Required?	Description
revisionIdentifier	CDATA	#IMPLIED	Revision of item on the BillOfMaterial
isSerializationRequired	(Yes | No)	#IMPLIED	Serial number required for item
globalBillOfMaterialTypeCode	(DirectMaterial | IndirectMaterial | Subassembly | PhantomSubassembly | EndProduct | Kit | Setup | AsNeeded | Reference | Nontangible | Other)	#IMPLIED	The type of material for the item
globalBillOfMaterialTypeCodeOther	CDATA	#IMPLIED	If the above globalBillOfMaterialTypeCode attribute is set to "Other", use this attribute to provide a more descriptive value. If the above globalBillOfMaterialTypeCode attribute is NOT set to "Other", LEAVE THIS FIELD BLANK.
notes	CDATA	#IMPLIED	Notes
BillOfMaterialItemIdentifier	CDATA	#IMPLIED	Descriptor of this Bill of MaterialItem
billOfMaterialItemUniqueIdentifier	IDREF	#IMPLIED	Refers to the unique identifier of an associated Item element. See discussion of "Inclusion of Linked Objects" in IPC 2571.
itemQuantity	CDATA	#IMPLIED	Quantity of items used
globalProductQuantityTypeCode	(PerAssembly | PerSetup | AsNeeded | Shrinkage | Other)	#IMPLIED	Indicates the units per which the quantity is required.
globalProductQuantityTypeCodeOther	CDATA	#IMPLIED	If the above globalProductQuantityTypeCode attribute is set to "Other", use this attribute to provide a more descriptive value. If the above globalProductQuantityTypeCode attribute is NOT set to "Other", LEAVE THIS FIELD BLANK.
description	CDATA	#IMPLIED	Description of item
ProprietarySequenceIdentifier	CDATA	#IMPLIED	Find number

7 ReferenceDesignators Element



The ReferenceDesignators element is used to hold a collection of ReferenceDesignator elements for the specific BillOfMaterialItem element. A reference designator identifies a single instance of a component. Reference designators normally are alphanumeric, are represented graphically on the schematic, and are used in the electrical interconnect description (net lists). When multiple use items occur (quantity of more than one) they will have more than one reference designator. In most cases the number of reference designators should equal the quantity specified for the containing item in the BillOfMaterialItem element. Although there is sometimes correlation between the item type and the reference designator letter (R1 is a resistor, C2 is a capacitor, etc), the reference designator letter cannot be relied on to define item type. Intelligent interpretation of reference designators is not recommended.

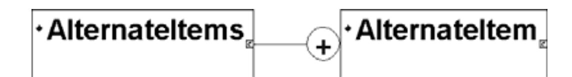
7.1 ReferenceDesignator Element



Each reference designator is represented by a ReferenceDesignator element. The number of ReferenceDesignator elements will usually equal the Quantity.

Attribute Name	Type	Required?	Description
referenceDesignatorName	CDATA	#REQUIRED	Name of reference designator, a tag given to electrical components

8 AlternateItems Element



An AlternateItems element contains one or more AlternateItem elements. An alternate item is a functionally identical part that may be used anywhere the containing primary item is used. An item that is an acceptable substitute in a specific application may also be listed as an AlternateItem in AlternateItems element within a BillOfMaterialItem.

8.1 AlternateItem Element

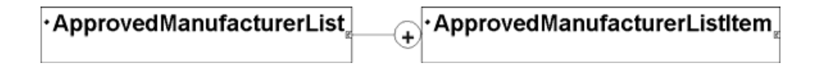


Each AlternateItem element represents an item that is an alternate to the containing item.

The globalPreferredStatusCode attribute can be used to numerically rank alternate items, giving the first choice a globalPreferredStatusCode of “1”, the second choice of “2” and so on.

Attribute Name	Type	Required?	Description
itemIdentifier	CDATA	# IMPLIED	Item Identifier of the alternate item
itemUniqueIdentifier	IDREF	#REQUIRED	Refers to the itemUniqueIdentifier attribute of the related Item element. See discussion of “Inclusion of Linked Objects” in IPC 2571.
globalPreferredStatusCode	CDATA	#IMPLIED	Rank order of the alternate item

9 ApprovedManufacturerList Element



An ApprovedManufacturerList element contains one or more ApprovedManufacturerListItem elements. It identifies all the approved manufacturers for a specific Item.

9.1 ApprovedManufacturerListItem Element

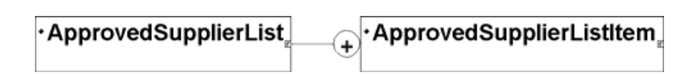


Each ApprovedManufacturerListItem element represents a manufacturer part that is used for a specific item.

The globalPreferredStatusCode attribute can be used in several ways depending on the needs of the data exchange. One typical use is to have one "Primary" manufacturer part and several "Alternate" manufacturer parts. Another use is to rank them numerically, giving the first choice a globalPreferredStatusCode of "1", the second choice of "2" and so on.

Attribute Name	Type	Required?	Description
manufacturerPartIdentifier	CDATA	#REQUIRED	Manufacturer part id
manufacturerPartUniqueIdentifier	IDREF	#IMPLIED	Refers to the manufacturerUniqueIdentifier in a ManufacturerPart element. Refer to IPC 2571 "Inclusion of Linked Objects" section. This creates a link between the approved manufacturer list and approved supplier list. Refer to the ManufactuerPart discussion later in this document.
manufacturerContactUniqueIdentifier	IDREF	#IMPLIED	Reference to the manufacturer contact element
globalManufacturerPartStatusCode	(Approved | QualityHold | UnderQualification | Unqualified | Disqualified | Obsolete | Nonpreferred | Conditional | Reference | Other)	#IMPLIED	Status of the manufacturer part.
globalManufacturerPartStatusCodeOther	CDATA	#IMPLIED	If the above globalManufacturerPartStatusCode attribute is set to "Other", use this attribute to provide a more descriptive value. If the above globalManufacturerPartStatusCode attribute is NOT set to "Other", LEAVE THIS FIELD BLANK.
globalPreferredStatusCode	CDATA	#IMPLIED	Preferred status code
description	CDATA	#IMPLIED	Manufacturer part reference notes
manufacturedBy	CDATA	#IMPLIED	Name of the manufacturer

10 ApprovedSupplierList Element



Approved Supplier Lists (ASL) are managed with the ApprovedSupplierList element. The ApprovedSupplierList element is used to hold a collection of ApprovedSupplierListItem elements.

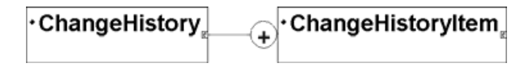
10.1 ApprovedSupplierListItem Element



Each item on the ApprovedSupplierList is represented by an ApprovedSupplierListItem.

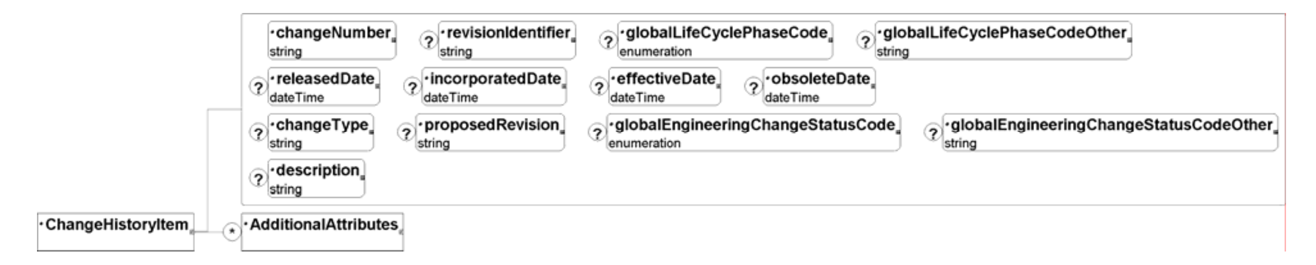
Attribute Name	Type	Required?	Description
supplierPartIdentifier	CDATA	#REQUIRED	Supplier part id
supplierPartUniqueIdentifier	ID	#IMPLIED	Refers to the supplierPartUniqueIdentifier in a SupplierPart element. See discussion of “Inclusion of Linked Objects” in the IPC 2571 document.
supplierPartContactUniqueIdentifier	IDREF	#IMPLIED	Reference to the supplier contact element
globalSupplierPartStatusCode	CDATA	#IMPLIED	Supplier part status Its values: Approved | QualityHold | UnderQualification | Unqualified | Disqualified | lNonpreferred | Conditional | …
comments	CDATA	#IMPLIED	Comments
suppliedBy	CDATA	#IMPLIED	Supplier name

11 ChangeHistory Element



The ChangeHistory element holds a collection of history elements that together describe the entire history of the related Item.

11.1 ChangeHistoryItem Element

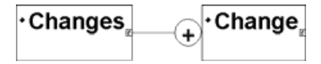


The Change History Item records the changes that occur in items after their initial release.

Attribute Name	Type	Required?	Description
changeNumber	CDATA	#REQUIRED	Number identifier of the change
revisionIdentifier	CDATA	#IMPLIED	Revision of item after it was changed
globalLifeCyclePhaseCode	(Design | Preliminary | Prototype | Pilot | Conditional | Production | Pending | Inactive | Unqualified | Disqualified | Obsolete | Other)	#IMPLIED	Lifecycle of item after it was changed
globalLifeCyclePhaseCodeOther	CDATA	#IMPLIED	If the above globalLifeCyclePhaseCode attribute is set to "Other", use this attribute to provide a more descriptive value. If the above globalLifeCyclePhaseCode attribute is NOT set to "Other", LEAVE THIS FIELD BLANK.
releasedDate	CDATA	#IMPLIED	Date the change was released
incorporatedDate	CDATA	#IMPLIED	Date the change was incorporated
effectiveDate	CDATA	#IMPLIED	Date the new Revision of the item is effective
obsoleteDate	CDATA	#IMPLIED	Date the old Revision is obsolete
changeType	CDATA	#IMPLIED	Type of change (Engineering Change Order, ECR, Deviation, etc.)
proposedRevision	CDATA	#IMPLIED	Proposed Revision

Attribute Name	Type	Required?	Description
globalEngineeringChangeStatus Code	(IssueIdentified | ChangeRequested | UnderInvestigation | ChangeOrderProposed |ApprovalPending | OnHold | Approved | Rejected | Completed | Released | Implemented | Other)	#IMPLIED	Change status codes
globalEngineeringChangeStatus CodeOther	CDATA	#IMPLIED	If the above globalEngineeringChangeStatusCode attribute is set to “Other”, use this attribute to provide a more descriptive value. If the above globalEngineeringChangeStatusCode attribute is NOT set to “Other”, LEAVE THIS FIELD BLANK.
description	CDATA	#IMPLIED	Description of change

12 Changes Element



Changes contains one or more Change elements such as engineering change orders related to a specific item.

The Changes element defines all the changes that are applicable for a specific Item. The Changes element is used to hold a collection of Change elements.

12.1 Change Element

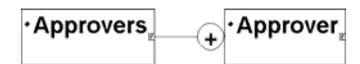


Each change is represented by a Change element. The type of change being represented is named in the changeType attribute, whose values include Engineering Change Order, Manufacturing Change Order, Deviation, etc.

Attribute Name	Type	Required?	Description
changeNumber	CDATA	#REQUIRED	Change number
revisionIdentifier	CDATA	#IMPLIED	Revision of this change
changeOriginatedByName	CDATA	#IMPLIED	Originator of the change
changeOriginatedByContactUniqueIdentifier	IDREF	#IMPLIED	Contact Identifier of the originator of the change
globalEngineeringChangeStatusCode	(IssueIdentified | ChangeRequested | UnderInvestigation | ChangeOrderProposed | ApprovalPending | OnHold | Approved | Rejected | Completed | Released | Implemented | Other)	#IMPLIED	Change status codes

Attribute Name	Type	Required?	Description
globalEngineeringChangeStatusCodeOther	CDATA	#IMPLIED	If the above globalEngineeringChangeStatusCode attribute is set to "Other", use this attribute to provide a more descriptive value. If the above globalEngineeringChangeStatusCode attribute is NOT set to "Other", LEAVE THIS FIELD BLANK.
changeStatusDate	CDATA	#IMPLIED	Date the status was modified
changeType	CDATA	#IMPLIED	Type of change. (Engineering Change Order, ECR, Deviation, etc.)
changeSubType	CDATA	#IMPLIED	Subclass of change
changeOriginationDate	CDATA	#IMPLIED	Date and time the change was originated
requestReason	CDATA	#IMPLIED	Reason for request
changeReason	CDATA	#IMPLIED	Reason for the change
workflow	CDATA	#IMPLIED	Identifier of the workflow assigned to this change
changeRequestDescription	CDATA	#IMPLIED	Description of request
changeOwnerName	CDATA	#IMPLIED	Owner or responsible party for the change
changeOwnerContactUniqueIdentifier	IDREF	#IMPLIED	Contact Identifier of owner or responsible party for the change
description	CDATA	#IMPLIED	Description of change

13 Approvers Element



The Approvers element contains all the Approver elements from different supply chain partners on a specific change.

13.1 Approver Element

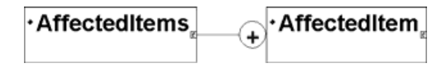


Each person required in the approval process is represented by a separate Approver element. Digital signatures may be embedded in the exchange through references to the Contact element.

Attribute Name	Type	Required?	Description
globalEngineeringChangeResponse Code	(Approve | Reject | Waive | ApproveWithConditions | ForwardToAnotherParty | Other)	#IMPLIED	Action performed by user.
globalEngineeringChangeResponse CodeOther	CDATA	#IMPLIED	If the above globalEngineeringChangeResponseCode attribute is set to “Other”, use this attribute to provide a more descriptive value. If the above globalEngineeringChangeResponseCode attribute is NOT set to “Other”, LEAVE THIS FIELD BLANK.
comments	CDATA	#IMPLIED	Comments by user
workflow	CDATA	#IMPLIED	Identifer of the workflow that is being signed off
globalApproverTypeCode	(Required | Optional | Informational | Other)	#REQUIRED	
globalApproverTypeCodeOther	CDATA	#IMPLIED	If the above globalApproverTypeCode attribute is set to “Other”, use this attribute to provide a more descriptive value. If the above globalApproverTypeCode attribute is NOT set to “Other”, LEAVE THIS FIELD BLANK.
approverName	CDATA	#REQUIRED	Name of user required to signoff

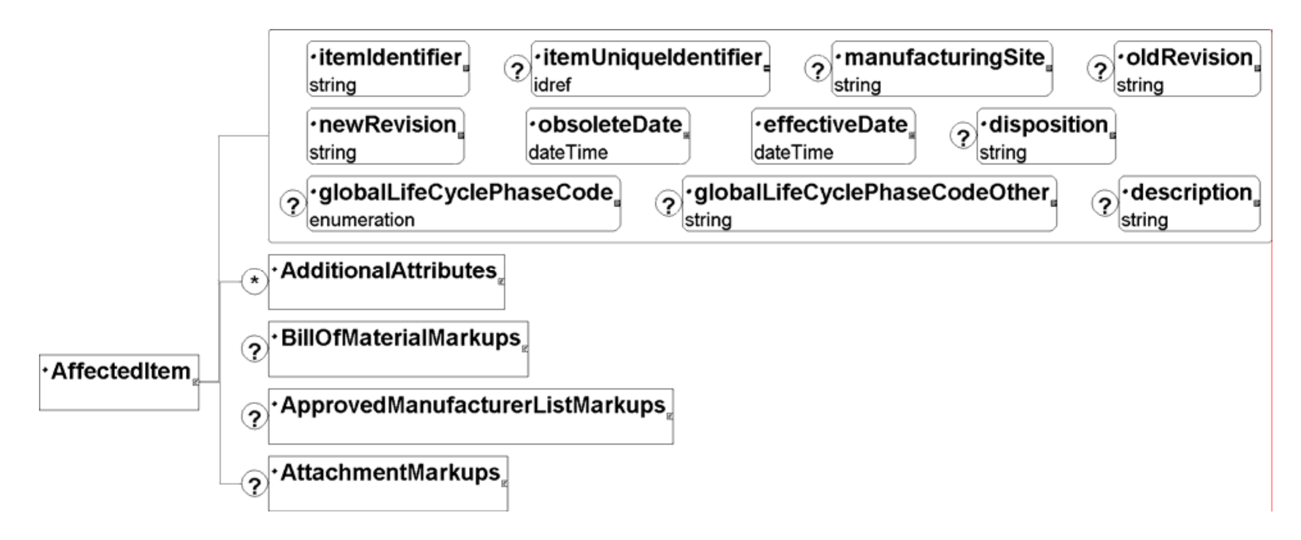
Attribute Name	Type	Required?	Description
approverContactUniqueIdentifier	IDREF	#IMPLIED	Refers to the contactUniqueIdentifier attribute of the Contact element for party required to signoff. Note that the Contact element allows for digital signatures to be contained within the transfer. See discussion of “Inclusion of Linked Objects” in IPC 2571.
alternateApproverContactUniqueIdentifier	IDREF	#IMPLIED	Refers to the contactUniqueIdentifier attribute of the Contact element for an alternate party required to signoff. Note that the Contact element allows for digital signatures to be contained within the transfer. See discussion of “Inclusion of Linked Objects” in IPC 2571.
approvedDate	CDATA	#IMPLIED	Date approver gave approval
approverWorkflowStatus	CDATA	#IMPLIED	Identifier of the status of the workflow that is being signed off
alternateApproverName	CDATA	#IMPLIED	Alternate contact to sign off

14 AffectedItems Element



The AffectedItems element contains all the AffectedItem elements that are affected by a change.

14.1 AffectedItem Element

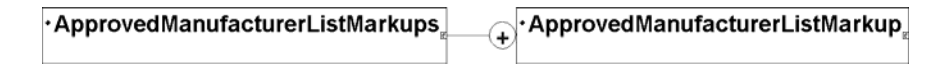


Each AffectedItem element represents an item that is affected by a change.

Attribute Name	Type	Required?	Description
itemIdentifier	CDATA	#REQUIRED	Affected item's identifier
itemUniqueIdentifier	IDREF	#IMPLIED	See Introduction document “Inclusion of Linked Objects”
manufacturingSite	CDATA	#IMPLIED	Manufacturing site that applied to this change
oldRevision	CDATA	#IMPLIED	Initial Revision of item before the change
newRevision	CDATA	#REQUIRED	Revision of item after the change
obsoleteDate	CDATA	#REQUIRED	Date the old Revision is obsolete
effectiveDate	CDATA	#REQUIRED	Date the new Revision is effective
disposition	CDATA	#IMPLIED	Disposition of item
globalLifeCyclePhaseCode	(Design | Preliminary | Prototype | Pilot | Conditional | Production | Pending | Inactive | Unqualified | Disqualified | Obsolete | Other)	#IMPLIED	Lifecycle phase of item

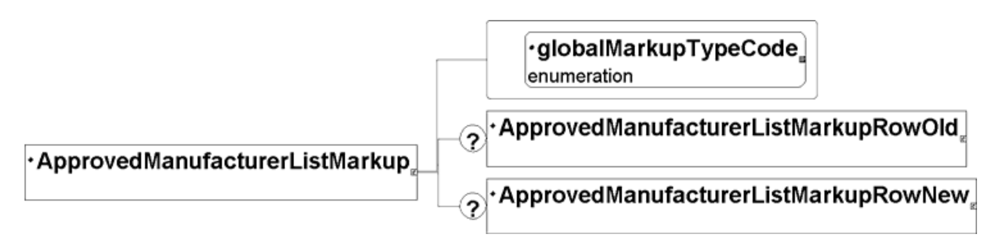
Attribute Name	Type	Required?	Description
globalLifeCyclePhaseCodeOther	CDATA	#IMPLIED	If the above globalLifeCyclePhaseCode attribute is set to “Other”, use this attribute to provide a more descriptive value. If the above globalLifeCyclePhaseCode attribute is NOT set to “Other”, LEAVE THIS FIELD BLANK.
description	CDATA	#IMPLIED	Description of item

15 ApprovedManufacturerListMarkups Element



Markups to an Approved Manufacturer List (AML) are represented in the ApprovedManufacturerListMarkups element. The ApprovedManufacturerListMarkups element is used to hold a collection of ApprovedManufacturerListMarkup elements.

15.1 ApprovedManufacturerListMarkup Element



Each ApprovedManufacturerListMarkup element represents a change to a manufacturer part that is used for a specific item on the BillOfMaterial.

The ApprovedManufacturerListMarkup describes the type of markup (add, modify, delete or nochange) for each manufacturer part on the ApprovedManufacturerList.

New manufacturer parts will have an ApprovedManufacturerListMarkupRowNew entry and no ApprovedManufacturerListMarkupRowOld entry.

Deleted manufacturer parts will have a ApprovedManufacturerListMarkupRowOld entry and no ApprovedManufacturerListMarkupRowNew entry.

Modified manufacturer parts will have both an ApprovedManufacturerListMarkupRowOld entry and an ApprovedManufacturerListMarkupRowNew entry. The old entry will describe the old manufacturer part, and the new entry will describe the new manufacturer part.

If there is no change, only an ApprovedManufacturerListMarkupRowOld entry is required.

Attribute Name	Type	Required?	Description
globalMarkupTypeCode	(Add | Modify | Delete | NoChange)	#REQUIRED	Kind of markup

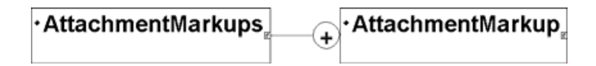
15.2 ApprovedManufacturerListMarkupRowOld & ApprovedManufacturerListMarkupRowNew Elements

ApprovedManufacturerListMarkupRowOld — ApprovedManufacturerListItem

ApprovedManufacturerListMarkupRowNew — ApprovedManufacturerListItem

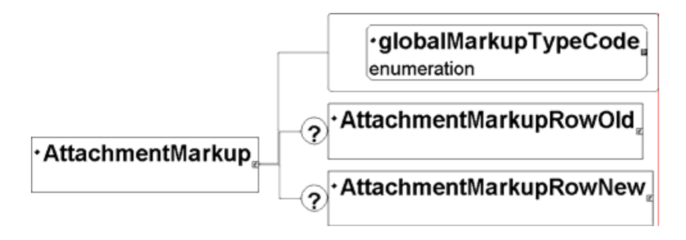
These elements represent the old and new manufacturer parts for a specific Item. These elements refer to either existing or new ApprovedMaufacturerListItem elements that are operated on by the globalMarkupTypeCode attribute.

16 AttachmentMarkups Element



Markups to attachments are represented in the AttachmentMarkups element. The AttachmentMarkups element is used to hold a collection of AttachmentMarkup elements.

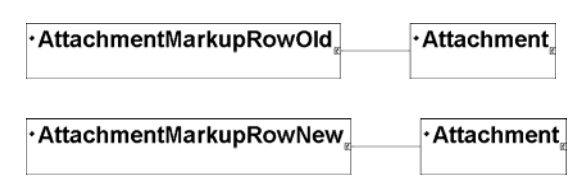
16.1 AttachmentMarkup Element



Each AttachmentMarkup element represents a change to an attachment that is used for a specific change. The AttachmentMarkup element describes the type of markup (add, modify, delete or nochange) for each attachment associated with the item.

Attribute Name	Type	Required?	Description
globalMarkupTypeCode	(Add | Modify | Delete | NoChange)	#REQUIRED	Kind of markup

16.2 AttachmentMarkupRowOld & AttachmentMarkupRowNew Elements



These elements represent the old and new attachments for a specific Item, and refer to either existing or new Attachment elements that are operated on by the globalMarkupTypeCode attribute.

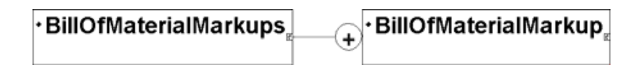
New attachments will have an AttachmentMarkupRowNew entry and no AttachmentMarkupRowOld entry.

Deleted attachments will have an AttachmentMarkupRowOld entry and no AttachmentMarkupRowNew entry.

Modified attachments will have both an AttachmentMarkupRowOld entry and an AttachmentMarkupRowNew entry. The old entry will describe the old attachments, and the new entry will describe the new attachments.

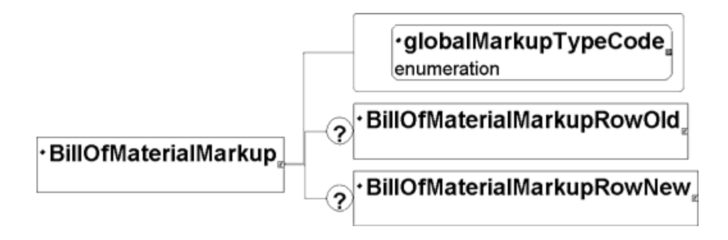
If there is no change, only an AttachmentMarkupRowOld entry is required.

17 BillOfMaterialMarkups Element



Markups to BillofMaterialItem elements are contained in the BillofMaterialMarkups element, which identifies all the proposed changes to a BillOfMaterialItem for a specific Change. The AttachmentMarkups element is used to hold a collection of AttachmentMarkup elements.

17.1 BillOfMaterialMarkup Element



Each BillOfMaterialMarkup element represents a proposed change to a BillOfMaterialItem that is used for a specific Change. The BillOfMaterialMarkups describe the type of globalMarkupTypeCode (add, modify, delete or nochange) for each item associated with the BillOfMaterial.

New items will have a BillOfMaterialMarkupRowNew entry and no BillOfMaterialMarkupRowOld entry.

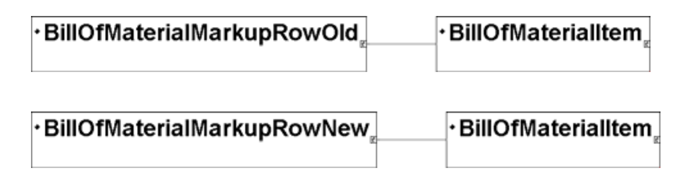
Deleted items will have a BillOfMaterialMarkupRowOld entry and no BillOfMaterialMarkupRowNew entry.

Modified items will have both a BillOfMaterialMarkupRowOld entry and a BillOfMaterialMarkupRowNew entry. The old entry will describe the old items, and the new entry will describe the new items.

If there is no change, only a BillOfMaterialMarkupRowOld entry is required.

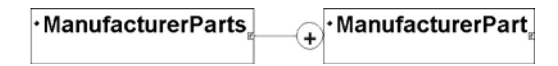
Attribute Name	Type	Required?	Description
globalMarkupTypeCode	(Add | Modify | Delete | NoChange)	#REQUIRED	Kind of markup

17.2 BillOfMaterialMarkupRowOld & BillOfMaterialMarkupRowNew Elements



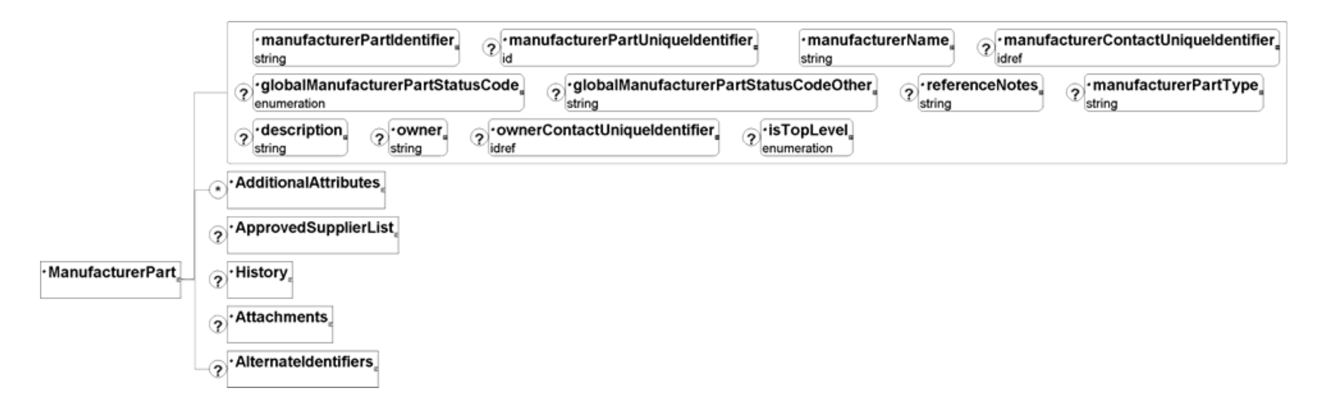
These elements represent the old and new BillOfMaterialItem elements for a specific Change. These elements refer to either existing or new BillOfMaterialItem elements that are operated on by the globalMarkupTypeCode attribute.

18 ManufacturerParts Element



The ManufacturerParts element defines all the manufacturer parts used or referenced within a given PDX file. The ManufacturerParts element is used to hold a collection of ManufacturerPart elements.

18.1 ManufacturerPart Element

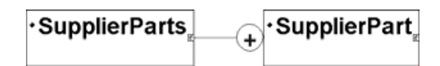


Each manufacturer part is represented by a ManufacturerPart element. A ManufacturerPart element is used to associate manufacturers and parts through the use of an approved manufacturer list.

Attribute Name	Type	Required?	Description
manufacturerPartIdentifier	CDATA	#REQUIRED	Manufacturer part id
manufacturerPartUniqueIdentifier	ID	#IMPLIED	Manufacturer part unique id.
manufacturerName	CDATA	#REQUIRED	Manufacturer's name
manufacturerContactUniqueIdentifier	IDREF	#IMPLIED	Manufacturer contact identifier. When present, it points to a contact element.
globalManufacturerPartStatusCode	(Approved | QualityHold | UnderQualification | Unqualified | Disqualified | Obsolete | Nonpreferred | Conditional | Reference | Other)	#IMPLIED	Status of manufacturer part.
globalManufacturerPartStatusCodeOther	CDATA	#IMPLIED	If the above globalManufacturerPartStatusCode attribute is set to “Other”, use this attribute to provide a more descriptive value. If the above globalManufacturerPartStatusCode attribute is NOT set to “Other”, LEAVE THIS FIELD BLANK.
referenceNotes	CDATA	#IMPLIED	Manufacturer part reference notes
manufacturerPartType	CDATA	#IMPLIED	Type of manufacturer part
description	CDATA	#IMPLIED	Description

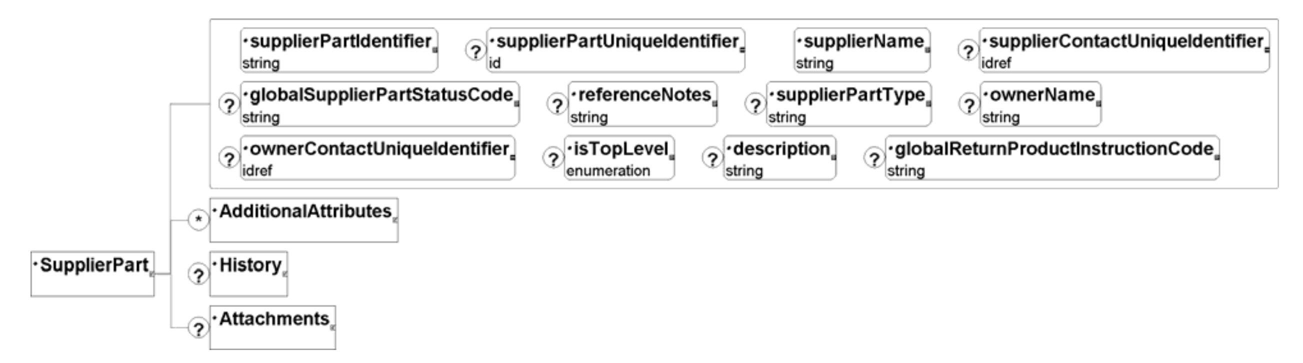
Attribute Name	Type	Required?	Description
owner	CDATA	#IMPLIED	Owner or responsible party for the manufacturer part
ownerContactUniqueIdentifier	IDREF	#IMPLIED	Contact Identifierof owner or responsible party for the manufacturer part
isTopLevel	Yes | No	#IMPLIED	See Introduction document “TopLevel attribute” (Default is No)

19 SupplierParts Element



The SupplierParts element defines all the supplier parts that are applicable for a specific ManufacturerPart. The SupplierParts element is a collection of SupplierPart elements.

19.1 SupplierPart Element

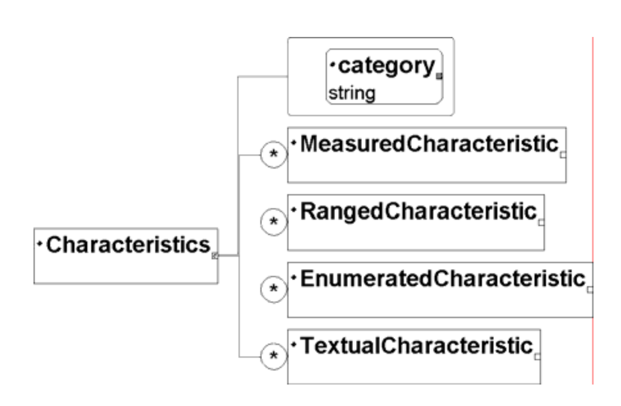


Each supplier part is represented by a SupplierPart element. A supplier part element is used to associate suppliers and parts through the use of an approved supplier list. For example, this element could represent a power supply purchased from a list of approved distributors or a spool of resistors purchased from an approved supplier.

Attribute Name	Type	Required?	Description	Alias
supplierPartIdentifier	CDATA	#REQUIRED	Supplier's part id	
supplierPartUniqueIdentifier	ID	#IMPLIED	Supplier’s part unique Identifier (may be a GTIN)	
supplierName	CDATA	#REQUIRED	Supplier’s name	
supplierContactUniqueIdentifier	IDREF	#IMPLIED	Supplier’s contact identifier. When present, it points to contact element.	
globalSupplierPartStatusCode	CDATA	#IMPLIED	Preferred or Alternate supplier part. Its values: Approve | Obsolete | QualityHold| UnderQualification| Unqualified| Disqualified| Nonpreferred| Conditional| Reference……	
referenceNotes	CDATA	#IMPLIED	Supplier part reference notes	
supplierPartType	CDATA	#IMPLIED	Type of supplier part	

Attribute Name	Type	Required?	Description	Alias
ownerName	CDATA	#IMPLIED	Owner or responsible party for the supplier part	
ownerContactUniqueIdentifier	IDREF	#IMPLIED	Contact Identifier of owner or responsible party for the supplier part	
isTopLevel	(Yes | No)	#REQUIRED	See discussion of "TopLevel attribute" in IPC 2571 (Default is No)	
description	CDATA	#IMPLIED	Description	
globalReturnProductInstructionCode	CDATA	#IMPLIED	It's values are: None| Noncancelable| Nonreturmable| NonreturnableNoncancelable| NotAvailable	

20 Characteristics



The Characteristics element is a collection of MeasuredCharacteristic, EnumeratedCharacteristic, RangedCharacteristic and TextualCharacteristic elements. All of the MeasuredCharacteristic and EnumeratedCharacteristic elements apply to the Item to which it is attached. One potential use of the value attributes within the four characteristics elements is to capture the query parameters used to select an item during a QuickData (RosettaNet PIP 2A9) query for an electrical device. Another potential use of the value attributes is through concatenating them together to create a description of the Item when displaying a list of Items.

Example

<Characteristics>

<MeasuredCharacteristic measuredCharacteristicName="Vcc" measuredCharacteristicValue="5.0" engineering UnitOfMeasure="VOLT" engineeringNegativeTolerance="10.0" engineeringPositiveTolerance="5.0"/>

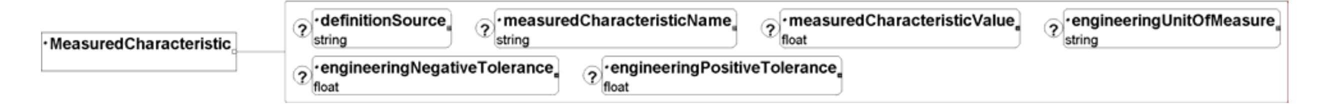
<MeasuredCharacteristic measuredCharacteristicName="Id" measuredCharacteristicValue="0.0005" engineering UnitOfMeasure="AMP" engineeringPositiveTolerance="5.0"/>

<EnumeratedCharacteristic enumeratedCharacteristicName="TempRange" enumeratedCharacteristicValue="IPC-2xxx3" definitionSource="http://webstds.ipc.org/2571/enums/TempRange" />

<EnumeratedCharacteristic enumeratedCharacteristicName="color" enumeratedCharacteristicValue="Blue" definitionSource="http://webstds.ipc.org/generic/colors" />

</Characterisitcs>

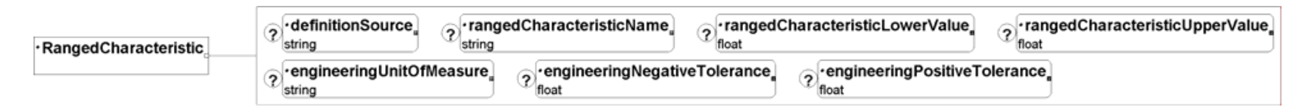
20.1 MeasuredCharacteristic element



A MeasuredCharacteristic is a distinguishing measurable value that is used to characterize the item. Examples of MeasuredCharacteristic include current, voltage, resistance, capacitance, inductance, and mechanical dimensions.

Attribute Name	Type	Required?	Description
definitionSource	CDATA	#IMPLIED	A URL pointing to the location which contains a list of allowed values for the this characteristic. Or a string defining the ISBN number, or some other identifier for the source of the definition.
measuredCharacteristicName	CDATA	#IMPLIED	The name of the characteristic, e.g. "leakage current", "breakdown voltage".
measuredCharacteristicValue	CDATA	#IMPLIED	The value of the characteristic expressed as a floating-point number.
engineeringUnitOfMeasure	CDATA	#IMPLIED	The unit of measure of the value. Allowed values for this field are OHM,FARAD,HENRY,VOLT,AMP,WATT,HERTZ, JOULE,LUMEN
engineeringNegativeTolerance	CDATA	#IMPLIED	the negative (minimum) tolerance of the device. The value is expressed as a positive floating-point percentage. (e.g. –15% is expesed as 15.0)
engineeringPositiveTolerance	CDATA	#IMPLIED	the posititve (maximum) tolerance of the device. The value is expressed as a positive floating-point percentage. (e.g. 10.3% is expesed as 10.3)

20.2 RangedCharacteristic element

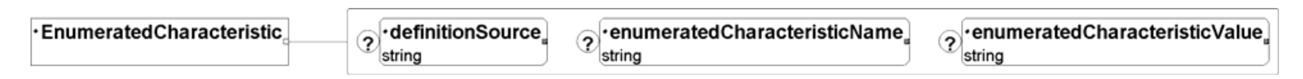


A RangedCharacteristic provides a distinguishing measurable value that is used to characterise an Item. Examples of RangedCharacteristic include current, voltage, resistance, capacitance, inductance, and mechanical dimensions.

Attribute Name	Type	Required?	Description
definitionSource	CDATA	#IMPLIED	A URL pointing to the location which contains a list of allowed values for the this characteristic. Or a string defining the ISBN number, or some other identifier for the source of the definition.
rangedCharacteristicName	CDATA	#IMPLIED	The name of the characteristic, e.g. "leakage current", "breakdown voltage".
rangedCharacteristicLowerValue	CDATA	#IMPLIED	The lower range value of the characteristic expressed as a floating-point number.
rangedCharacteristicUpperValue	CDATA	#IMPLIED	The upper range value of the characteristic expressed as a floating-point number.

Attribute Name	Type	Required?	Description
engineeringUnitOfMeasure	CDATA	#IMPLIED	The unit of measure of the value. Allowed values for this field are OHM,FARAD,HENRY,VOLT,AMP,WATT,HERTZ, JOULE,LUMEN
engineeringNegativeTolerance	CDATA	#IMPLIED	the negative(minimum) tolerance of the device. The value is expressed as a positive floating-point percentage. (e.g. –15% is expessed as 15.0)
engineeringPositiveTolerance	CDATA	#IMPLIED	the posititve(maximum) tolerance of the device. The value is expressed as a positive floating-point percentage. (e.g. 10.3% is expessed as 10.3)

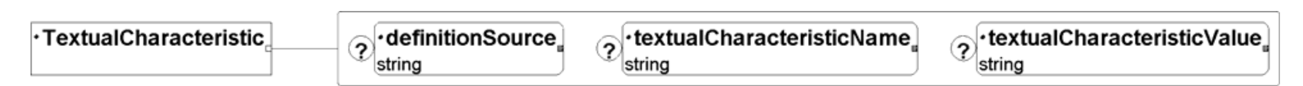
20.3 EnumeratedCharacteristic element



An EnumeratedCharacteristic is one of an enumerated list of potential values, such as a performance rating, a purchasing unit (ea, gross, carton). The allowed enumerated values of the EnumeratedCharacteristic are defined in the source referred to in the definitionSource attribute.

Attribute Name	Type	Required?	Description
enumeratedCharacteristicName	CDATA	#IMPLIED	The attribute name
enumeratedCharacteristicValue	CDATA	#IMPLIED	The attribute value
definitionSource	CDATA	#IMPLIED	A URL pointing to the location which contains a list of allowed values for the this characteristic. Or a string defining the ISBN number, or some other identifier for the source of the definition.

20.4 TextualCharacteristic element



A TextualCharacteristic refers to a list of allowed textual values. The allowed values of the TextualCharacteristic are defined at the source contained in the definitionSource attribute.

Attribute Name	Type	Required?	Description	Alias
textualCharacteristicName	CDATA	#IMPLIED	The attribute name	
textualCharacteristicValue	CDATA	#IMPLIED	The attribute value	
definitionSource	CDATA	#IMPLIED	A URL pointing to the location which contains a list of allowed values for the this characteristic. Or a string defining the ISBN number, or some other identifier for the source of the definition.	

Appendix A – IPC Web-based Standards (IPC25XX)

The web-based standards (IPC 25XX) are designed to foster application integration and electronic commerce through data and information interchange standards based on XML. There is no need for a common object model, programming language, network protocol, persistent storage mechanism or operating system for two applications to exchange XML messages formatted using the web-based standards. The two applications simply need to be able to format, transmit, receive and consume a standardized XML message.

A web-based standards series have been identified for each of the value-added activities occurring throughout the product life cycle of an electronics product. The web-based standards are:

IPC-2500 – Framework Standard

IPC-2510 – Product Data Representation

IPC-2520 – Product Data Quality

IPC-2530 – Surface Mount Equipment Standard Recipe File Format

IPC-2540 – Shop Floor Equipment Communications

IPC-2550 – Manufacturing Execution Systems Communications

IPC-2560 – Enterprise Resource Planning Systems Communications

IPC-2570 – Supply Chain Communications

Table A-1 shows the correlation of the different standards in each of the series. Although not every standard has been started, the figure represents a coordinated opportunity to maintain consistency throughout the standard development cycle.

Table A-1 CAD/CAM Standardization

IPC Number/ Function	-xxx1 Generic	-xxx2 Administ	-xxx3 Documnt	-xxx4 Board Fabricat	-xxx5 Bare Bd Test	-xxx6 Assy Manufac	-xxx7 Assy/ Test/ Insp.	-xxx8 Comp. & Material	-xxx9 Informa. Modeling
IPC-2500 CAMX Framework	IPC-2501 PINS								
IPC-2510 GenCAM Product Data	IPC-2511A (Pub)	IPC-2512A (Pub)	IPC-2513A (Pub)	IPC-2514A (Pub)	IPC-2515A (Pub)	IPC-2516A (Pub)	IPC-2517A (Pub)	IPC-2518A (Pub)	IPC-2519A (Pub)
IPC-2520 Quality Product Data				IPC-2524 (Pub)					
IPC-2530 SRFF Process Data Recipe file	IPC-2531 ANSI Draft								
IPC-2540 Shop Floor Communicate	IPC-2541 (Pub)					IPC-2546 (Pub)	IPC-2547 2nd IF		
IPC-2550 Execution Communicate	IPC-2551 PINS			IPC-2554 Working draft		IPC-2556 PINS			
IPC-2560 Enterprise Communicate									
IPC-2570 Supply Chain Communicate	IPC-2571 (Pub)					IPC-2576 (Pub)	IPC-2577 Proposal	IPC-2578 (Pub)	